Component of Statistics Canada Catalogue no. 82-003-X
Health Reports

Article

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June, 2014

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..	not available for a specific reference period
...	not applicable
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0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

Prevalence of migraine in the Canadian household population

by Pamela L. Ramage-Morin and Heather Gilmour

Abstract

Based on data from the 2010 and 2011 Canadian Community Health Surveys and the 2011 Survey of Living with Neurological Conditions in Canada, this article provides information about migraine among people living in private households. In 2010/2011, an estimated 8.3% of Canadians (2.7 million) reported that they had been diagnosed with migraine by a health professional. Females were more likely than males to report migraine: 11.8% versus 4.7%. Migraine prevalence was highest among people in their 30s and 40s: 17.0% for women and 6.5% for men. Compared with the national figure, the prevalence of migraine was lower in Quebec (6.8%) and higher in Manitoba (9.5%), Nova Scotia (9.1%) and Ontario (8.8%). Among people who reported a migraine diagnosis, 42% took prescription medication for their condition, and 56% incurred medication-related out-of-pocket expenses. Migraine was highly comorbid with depression and affected many aspects of daily life including education, work, sleep, and driving.

Keywords

Neurological disease, survey, prevalence

Authors

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Migraine can be a debilitating disorder characterized by pulsating headaches lasting from a few hours to several days, accompanied by nausea, vomiting, and/or sensitivity to light and sound. It is exacerbated by and tends to interfere with physical activity. Migraine usually occurs on one side of the head, although in children and youth it tends to be bilateral.[1]

An estimated 14% of the world's population have suffered from migraine at some point.[2] Studies consistently show that women are more likely than men to experience migraine.[2,3]

Migraine is recognized as a major cause of disability.[2] A global study ranked migraine eighth in years lived with disability, a measure of the burden of disease.[4] The cost to individuals, their families and the community is high in terms of quality of life, absenteeism from school and work, lost productivity, and medication expenses.[5,6]

Using data for 2010/2011, this study provides up-to-date estimates of the prevalence of migraine diagnosed by a health professional, as well as estimates of migraine burden (see *The data*). Gaps addressed in this analysis include the prevalence among children younger than 12 and impacts on usual activities. Migraine diagnosed by a health professional is henceforth referred to simply as "migraine"; those diagnosed with migraine are referred to as "migraineurs."[7]

Prevalence of migraine

In 2010/2011, an estimated 8.3% of Canadians (2.7 million) reported that they had been diagnosed with migraine (Table 1). This likely underestimates migraine prevalence. Research indicates that some people who experience migraine do not seek professional help, and therefore, would not have a diagnosis to report.[8,9]

To identify migraineurs, most studies employ the International Classification of Headache Disorders (ICHD) criteria, rather than self-reported diagnosis (Appendix Table A). However, even among studies that used ICHD criteria, prevalence estimates vary widely—from 2.4% to 27.5% in some American and European studies.[10-15] The prevalence in the present study (Table 1) is below estimates based on results of three population surveys in the United States: 22.7% in the National Health and Nutrition Examination Survey; 16.6% in the National Health Interview Survey; and 11.7% in the American Migraine Prevalence and Prevention study.

The data

Data source

This study is based on data from the Neurological Conditions Prevalence File, which was derived from the 2010 and 2011 Canadian Community Health Survey – Annual Component (CCHS), and the 2011 Survey of Living with Neurological Conditions in Canada (SLNCC).Documentation for these surveys is available at www.statcan.gc.ca.

CCHS is a cross-sectional survey that collects information about health status, determinants of health, and health care use for people aged 12 or older living in private households. The sampling frame excludes full-time members of the Canadian Forces, the institutionalized population, and people living in some remote areas and on reserves and other Aboriginal settlements in the provinces. The Neurological Conditions module captured information on all household members, including children younger than 12. Respondents who agreed to share their data with the survey's share partners—the Public Health Agency of Canada, Health Canada, provincial ministries of health, Institut de la Statistique du Quebec (respondents living in Québec)—were included in the Neurological Conditions Prevalence File, which had a sample size of 285,971 and a response rate of 70.6%.

The SLNCC is a cross-sectional survey designed to explore issues related to neurological conditions among people aged 15 or older living in private households. In addition to the groups routinely excluded from the CCHS, the SLNCC excluded residents of the three territories. The SLNCC sample was composed of 4,569 respondents for a response rate of 81.6%. This study uses a subsample of 372 respondents (295 females, 77 males) with migraine but none of the other neurological conditions included on the survey. They represent an estimated 970,000 Canadians, 84.2% of whom were female, with an average age of 42.6 years.

Definitions

Respondents to the CCHS were asked to report on selected neurological conditions that had lasted or were expected to last six months or more and had been diagnosed by a health professional (Appendix B).

Additional questions in the SLNCC referred to the past 12 months.[16,17] Those with positive responses to at least two of the three follow-up questions were categorized as having "current" migraine:

Did you have a headache where you felt nauseated or sick to your stomach?

Did light bother you when you had a headache (a lot more than when you did not have a headache)?

Did your headache limit your ability to work, study or do what you needed to do for at least a day?

Scores on the 9-item Patient Health Questionnaire (PHQ-9)[18] were used to classify depression: no depression (0), minimal/mild (1 to 9), or moderate/moderately severe /severe (10 to 27).

Respondents were asked if they had taken prescription medication in the past three months for their neurological condition. They were instructed to include non-prescription medication if it had been prescribed by a health professional. Those who responded "no" were asked to indicate all reasons that applied for not taking prescription medication. Responses of "side effects caused by medication," "medication not working," "ran out of medication," "too costly/financial constraints" or "other" were combined because of small sample size.

Questions about out-of-pocket expenses referred to prescription and non-prescription medications related to their neurological condition that would not be reimbursed by insurance or government programs. The reference period was the past 12 months.

Responses to the question, "Overall, how much do you feel that your neurological condition(s) affects your life?", were categorized as "not at all" or "a little bit" versus "moderately", "quite a bit" or "extremely."

Respondents who answered "no" to the question, "Are you usually free of pain or discomfort?", were asked how many activities their pain prevents. Those who responded "a few," "some" or "most" (versus "none") were considered to have *pain that prevents activities*.

Respondents who reported that because of their neurological condition they felt left out of things "sometimes," "often" or "always" were grouped versus those who responded "never" or "rarely."

Respondents older than 16 who had a valid driver's licence were asked if their neurological condition had ever prevented them from driving, even for a short time.

Responses to the question, "How much do you feel that your condition has limited you in getting a good night's sleep?" were grouped into three categories: "not at all," "a little bit/moderately," or "quite a bit/extremely."

Based on their employment status in the week before the interview, respondents were classified as *currently working* if they had worked at a job or business or been absent from work; *did not have a job last week*; or *permanently unable to work*. Respondents older than age 75 were excluded.

Changed work activities indicates whether respondents who had previously been employed had ever changed their work activities for a at least three months because of their neurological condition, such as reducing hours, changing the type of work, or stopping work altogether.

Currently employed respondents younger than 76 were asked, "In the past three months, how many days of work have you missed because of your condition(s)?"

Socio-demographic variables included in the analysis were sex, age, and province or territory of residence.

Weighted frequencies, cross-tabulations and means were used to examine the prevalence of migraine in Canada and its impact on migraineurs. To account for survey design effects, standard errors and coefficients of variation were estimated using the bootstrap technique.[19,20]

Limitations

The criteria for identifying migraineurs differ between the CCHS and the SLNCC. In the CCHS, which was used for prevalence estimates, respondents were classified as migraineurs if they reported that their condition had been diagnosed by a health professional. This differs from the ICHD criteria, which are considered the gold standard (Appendix Table A). Consequently, the prevalence of migraine in this study is likely an underestimate, as it is influenced by factors such as access to health care and the decision to seek care. The SLNCC, which was used to study the impact of migraine, contains additional criteria that have been shown to be a good replacement for the full ICHD criteria.[16,17] However, in the SLNCC, respondents were also instructed to report *diagnosed* migraine.

All neurological conditions were self-reported and not verified by another source. It is not possible to differentiate between primary headaches and those resulting from other disorders or between the major migraine subtypes—with or without aura.

Chronic and episodic migraine are not distinguished, the former being associated with greater disability.[6,21]

Without a specified period, the CCHS migraine question likely captures a mix of lifetime and current migraine. The additional questions in the SLNCC refer to the past 12 months; therefore, the analysis of associations between migraine and other factors pertains to the population with "current" migraine.

Questions about medication use specified "prescribed" medications, which could include over-the-counter drugs only if they had been prescribed by a health professional. On the other hand, when asked about out-of-pocket expenses, respondents were instructed to report prescription and non-prescription medications. Thus, the medications being considered may differ when respondents report on "use" versus "expenses."

The study pertains to people living in private households and does not represent residents of health care institutions. Information about children younger than 12 is limited to prevalence estimates. Migraine-specific questions, such as medication use, age of onset/diagnosis and impacts, were asked on the SLNCC, which has a minimum age of 15.

Stovner et al.[15] note that differences in methodologies used by population-based studies have made comparisons difficult and point to the need to standardize methodological guidelines for migraine studies.

Females were more than twice as likely as males to report migraine (11.8% versus 4.7%), a pattern that prevailed among all age groups except children younger than 12 (Figure 1). Fewer than 1% of children had migraine, and no significant difference emerged between boys and girls. For both sexes, prevalence was highest at ages 30 to 49; the mean age for women was 43, slightly older than for men (40) ($p < 0.01$).

On average, migraine was diagnosed at age 26.2, 3.6 years after symptoms were first experienced ($p < 0.01$). There was no significant difference by sex, contrary to earlier findings that onset peaks earlier for men than women.[4]

Compared with the national figure, migraine prevalence was lower in Quebec (6.8%) and higher in Manitoba (9.5%), Nova Scotia (9.1%) and Ontario (8.8%). These differences persisted even after age-standardization (data not shown). An earlier Canadian study[8] also reported lower migraine prevalence in Quebec. Studies in Germany[14] and Spain[13] have observed differences within regions of the same country.

Table 1
Sample, estimated population and percentage reporting migraine diagnosis, by selected charatceristics, household population, Canada, 2010/2011

	Sample size	Estimated population '000	Prevalence %
Canada	22,720	2,707.4	8.3
Migraineurs with other selected neurological conditions‡	1,451	170.9	0.5
Migraineurs without other selected neurological conditions	20,886	2,478.6	7.7
Sex			
Female	16,470	1,941.4	11.8*
Male†	6,250	766.0	4.7
Age group			
0 to 11	293	31.6	0.7*
12 to 29	4,550	604.0	8.1*
30 to 49†	9,078	1,177.9	12.1
50 to 64	6,518	664.9	9.9*
65 or older	2,281	229.0	5.1*
Province			
Newfoundland and Labrador	689	43.8	8.8
Prince Edward Island	352	12.2	8.7
Nova Scotia	905	83.1	9.1*
New Brunswick	908	63.7	8.9
Quebec	3,313	518.8	6.8*
Ontario	8,448	1,116.0	8.8*
Manitoba	1,298	108.0	9.5*
Saskatchewan	1,277	81.4	8.4
Alberta	2,258	311.5	8.7
British Columbia	2,686	361.3	8.3
Yukon	221	2.5	7.3
Northwest Territories	219	3.4	8.0
Nunavut	146	1.7	7.6

* significantly different from reference group ($p < 0.05$)
† reference group; Canada is reference group for provincial comparisons
‡ ALS (Lou Gehrig's disease/amyotrophic lateral sclerosis), Alzheimer's disease or any other dementia, brain injury, brain tumour, cerebral palsy, dystonia, effects of a stroke, epilepsy, Huntington's disease, hydrocephalus, multiple sclerosis, muscular dystrophy, Parkinson's disease, spina bifida, spinal cord injury, spinal cord tumour, Tourette's syndrome

Note: Sample, estimated population and prevalence for Canada exceed sum of subcategories because of 383 people who could not be classified (reported migraine but were missing information on other selected neurological conditions).

Source: 2010/2011 Canadian Community Health Survey - Neurological Prevalence File

Most migraineurs reported migraine as their only neurological condition (Table 1). Nonetheless, they were more likely than non-migraineurs to report that they had also been diagnosed with a brain or spinal cord injury, epilepsy, or the effects of a stroke (Appendix Table B).

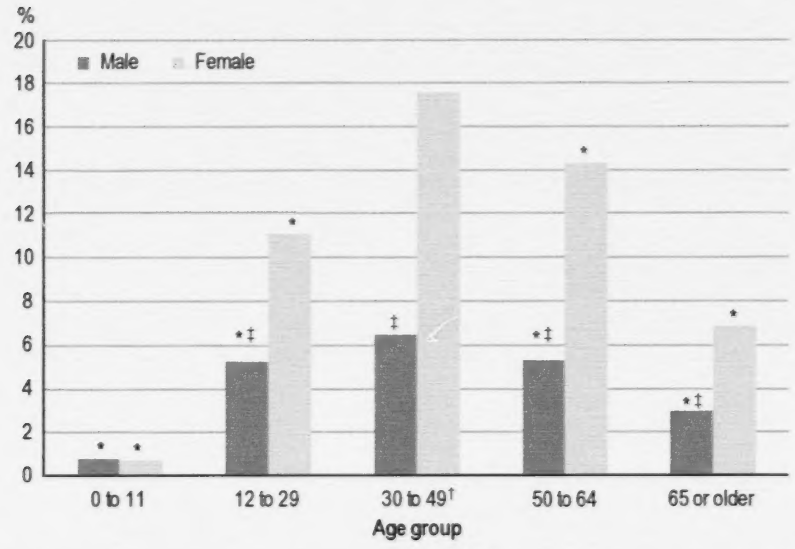
The majority of migraineurs reported symptoms of depression—63% were classified with minimal or mild depression, and 20% had moderate to severe depression. The relationship of these two disorders is well established in epidemiological literature: migraine increases the risk of depression, and depression increases the risk of migraine.[20-25]

Medication use

Fewer than half of migraineurs (42%) reported that they had taken prescription medication for the condition in the past three months (Table 2). Migraineurs aged 50 or older were more likely than those aged 15 to 49 to have taken prescription medication (57% versus 35%; $p \leq 0.01$).

Given that migraineurs, as defined in this study, must have reported a diagnosis, the low percentage taking prescription medication was not due to under-diagnosis. The percentage using medication would likely be much higher if non-prescribed products had been included in survey questions.[26,27]

Figure 1
Percentage reporting migraine diagnosis, by age group and sex, household population, Canada 2010/2011



† reference group
* significantly different from reference group ($p < 0.05$)
‡ significantly different from female ($p < 0.05$)
Source: 2010/2011 Canadian Community Health Survey - Neurological Prevalence File

Among migraineurs not taking prescription medication, the most frequent reasons were that they did not need it (35%), it had not been prescribed (25%), and they did not want it (14%). More than half (56%) of migraineurs reported incurring out-of-pocket medication expenses in the past 12 months for which they would not be reimbursed.

Impact on usual activities

About one-quarter of migraineurs experienced pain that prevented activities (26%) or felt left out of things because of their condition (26%). More than half (53%) reported that migraine had prevented them from driving, at least for a short time. Migraine limited getting a good night's sleep for three-quarters of migraineurs (76%). Almost a third (30%) reported limitations in educational opportunities.

Employment

About one-third of migraineurs reported limitations in job opportunities (34%), although the majority were currently employed (70%). Over one-third of those currently working (36%) reported missing at least one day of work in the past three months owing to migraine. Nearly one in five (18%) who had previously been employed reported that they had changed their work activities (hours, type of work, or stopped work) for at least three months because of migraine. Previous studies indicate that migraine is strongly associated with lost productive time, most of which is linked to presenteeism (reduced productivity) rather than absenteeism.[21,28]

Table 2
Percentage of migraineurs reporting selected characteristics, household population aged 15 or older, Canada excluding territories, 2011

Characteristic	%	95% confidence interval from	to
Depression			
No depression	16.6[E]	11.7	23.2
Minimal/Mild	63.3	54.8	70.9
Moderate/Moderate-severe/Severe	20.1[E]	14.3	27.5
Medication			
Prescription medication for migraine (past 3 months)	41.7	33.9	49.9
Reasons for not taking prescription medication (past 3 months)			
No medication prescribed	25.2[E]	16.4	34.0
Do not want to take medication	14.3[E]	6.2	22.3
Condition controlled without medication/Don't need medication	34.8	25.2	44.4
Other[‡]	39.9	29.7	50.1
Non-reimbused out-of-pocket prescription/non-prescription medication expenses (past 12 months)	56.2	48.7	63.6
Impact on usual activities			
Affects life at least moderately	38.2	30.6	46.4
Pain prevents activities	25.5	19.2	31.8
Felt left out of things	25.9	18.6	34.9
Prevented from driving (aged 16 or older with valid driver's license)	52.5	44.1	60.7
Limited getting good night's sleep			
Not at all	24.1	17.3	32.5
A little bit/Moderately	50.4	47.9	64.5
Quite a bit/Extremely	19.6	14.2	26.2
Limited educational opportunities			
Not at all	69.7	62.0	76.4
A little bit/Moderately	26.6	20.0	34.3
Quite a bit/Extremely	3.8[E]	2.1	6.5
Limited job opportunities			
Not at all	66.0	58.4	72.9
A little bit/Moderately	27.4	20.7	35.3
Quite a bit/Extremely	6.6[E]	3.9	10.8
Employment status (aged 15 to 75)			
Currently employed	70.2	62.7	76.8
Did not have a job	24.0	18.0	31.2
Permanently unable to work	5.8[E]	3.5	9.5
Changed work activites[†]	18.0[E]	12.4	25.5
Missed at least 1 day of work past 3 months (aged 15 to 75, currently employed)	36.0	26.2	47.0

† aged 15 to 75, not currently employed, who had ever worked at job or business and had neurological condition while working
‡ includes side effects caused by medication, medication not working, ran out of medication, and too costly/financial constraints
E interpret with caution
Note: Based on migraineurs without other selected neurological conditions (see Table 1).
Source: 2011 Survey of Living with Neurological Conditions in Canada.

Conclusion

This study presents the most current estimates of the prevalence and impact of migraine in Canada. In 2010/2011, an estimated 2.7 million Canadians had migraine headaches. Many of them reported that migraine affected their daily life, including work and educational opportunities. The disorder was associated with medication use, pain, depression, difficulty sleeping, and the ability to drive. ■

Acknowledgements

Statistics Canada thanks all participants for their input and advice during the development of the neurological content for the Canadian Community Health Survey (CCHS) and the Survey on Living with Neurological Conditions in Canada (SLNCC). The content was developed jointly by the Health Statistics Division at Statistics Canada and the Public Health Agency of Canada (PHAC), with input from PHAC's expert advisory group members who specialize in the study of neurological conditions. Content selection was based on objectives and data requirements specified by PHAC. Sponsorship was provided by PHAC as part of the National Population Health Study of Neurological Conditions.

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Appendix

Table A
Criteria for defining migraine

International Headache Society	Statistics Canada	
International Classification of Headache Disorders (ICHD), 3rd edition	**2010/2011 Canadian Community Health Survey (CCHS) Neurological conditions**	**2011 Survey of Living with Neurological Conditions in Canada (SLNCC)**
A. At least five attacks fulfilling criteria B to D	Now I'd like to ask about neurological conditions, which are conditions that affect the brain, spinal cord, nerves or muscles. Please do not include mental health conditions such as depression, anxiety disorder or schizophrenia. We are interested in conditions which are expected to last or have already lasted six months or more and have been diagnosed by a doctor or other health professional.	Now, I'd like to ask some questions about neurological conditions, which are conditions that affect the brain, spinal cord, nerves or muscles. We are interested in conditions which are expected to last or have already lasted six months or more and have been diagnosed by a doctor or other health professional.
B. Headache attacks lasting 4 to 72 hours (untreated or unsuccessfully treated)	Do you have migraine headaches?	To begin, do you have migraine headaches that have been diagnosed by a health professional?
C. Headache has at least two of following four characteristics: 1. unilateral location 2. pulsating quality 3. moderate or severe pain intensity 4. aggravation by or causing avoidence of routine physical activity (for example, walking or climbing stairs)	Who has this condition?	Positive response to at least two of the following questions: In the past 12 months: • did you have a headache where you felt nauseated or sick to your stomach? • did light bother you when you had a headache (a lot more than when you did not have a headache)? • did your headache limit your ability to work, study, or do what you needed to do for at least one day?
D. During headache at least one of following: 1. nausea and/or vomiting 2. photophobia and phonophobia		
E. Not better accounted for by another ICHD-3 diagnosis		

Table B
Percentage reporting diagnosis of selected neurological conditions, by migraine status, household population, Canada, 2010/2011

	Migraineurs			Non-migraineurs		
		95% confidence interval			95% confidence interval	
Neurological condition	Prevalence %	from	to	Prevalence %	from	to
Alzheimer's/Other dementia (35 or older)	0.6[E]	0.4	0.9	0.6	0.5	0.7
Brain injury	1.3*	1.1	1.6	0.3	0.3	0.4
Brain tumour	0.4*	0.3	0.5	0.1	0.1	0.1
Cerebral palsy	0.2[E]	0.1	0.3	0.1	0.1	0.1
Effects of stroke	1.6*	1.3	1.9	0.9	0.9	1.0
Epilepsy	0.8*	0.6	1.0	0.4	0.3	0.4
Multiple sclerosis	0.8*	0.6	1.1	0.2	0.2	0.3
Muscular dystrophy	0.2*[E]	0.1	0.3	0.1	0.1	0.1
Spina bifida	0.3*[E]	0.2	0.5	0.1	0.1	0.1
Spinal cord injury	1.2*	1.0	1.5	0.3	0.3	0.3
Tourette's syndrome	0.1[E]	0.1	0.2	0.1	0.1	0.1
Other neurological conditions[†]	0.5*	0.3	0.7	0.3	0.2	0.3

* significantly different from non-migraineurs ($p < 0.05$)
[E] interpret with caution
[†] ALS (Lou Gehrig's disease/amyotrophic lateral sclerosis), Huntington's disease, Parkinson's disease, dystonia, hydrocephalus, and/or spinal cord tumour
Source: 2010/2011 Canadian Community Health Survey - Neurological Prevalence File.